FIRM SIZE, IDIOSYNCRATIC RISK, AND SHAREHOLDER GAINS IN CORPORATE ACQUISITIONS

by

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ABSTRACT

Small acquirers experience greater abnormal returns upon acquisition announcements (other things equal) than large acquirers. In efficient markets, the persistence of differential abnormal returns over time and across industries would imply that shareholder wealth effects of corporate acquisitions diminish as firms grow, possibly due to greater agency problems at large firms.

The evidence presented in this paper is consistent with the hypothesis that the differential market response is related to limits to arbitrage, rather than differential value creation among small and large acquirers. I find a difference in abnormal announcement returns only in acquisitions of private and subsidiary targets: events that are interpreted by the market as positive news. My results suggest that announcements made by small acquirers are associated with costlier short sales and larger abnormal trading volume resulting in greater temporary price pressure.

The evidence is inconsistent with the hypothesis that large acquirers' overpayment for the target and/or greater operating synergies by small acquirers explain the size effect in shareholder gains.

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CHAPTER 1

INTRODUCTION

The empirical finance literature reports an interesting puzzle: small public firms' acquisition announcements create greater size adjusted shareholder value than those of large public firms (Moeller, Schlingemann, and Stulz (2004)). Firm size is a statistically and economically significant independent variable in several event study regressions of shareholder gains even when controls are employed for deal and firm characteristics (Moeller, Schlingemann, and Stulz (2005), Faccio, McConnell, and Stolin (2006), Masulis, Cong, and Xie (2007), Offenberg (2009), Harford, Humphery-Jenner, and Powell (2012)).

This paper explores the sources of differential abnormal returns among small and large acquirers. In efficient markets, abnormal stock returns around corporate events reflect the event's impact on shareholder wealth, as long as the event is unanticipated (Brown and Warner (1980)). If markets are efficient, the empirical result that small acquirers' announcements consistently generate greater abnormal stock returns than those of large acquirers suggests that – other things equal – shareholders are better off because the acquisition increases the fundamental value of the firm to a greater extent. This explanation would be consistent with The Nature of the Firm. Coase's seminal paper (1937) suggests that an optimal firm size exists where the marginal cost of production utilizing internal coordination is equal to that of employing the external price mechanism.

The Coasian explanation of the size effect in shareholder gains suggests that acquisition announcements made by firms below the optimal size (small firms) generate more size adjusted shareholder wealth than acquisitions by firms above the optimal size (large firms), because the former has a greater potential for enhancing profitability by growth via acquisitions. As firms grow, profits eventually fail to keep up with the number and complexity of management tasks due to diminishing returns to management.

In contrast, if market efficiency is distorted by investors' tendency to overreact to news, then differential abnormal returns can arise from greater overreaction when short-selling constraints prevent arbitrageurs from mitigating excessive price movements. Short-selling restrictions exclude investors with pessimistic valuations from the trading pool (Miller (1977)) and allow optimistic investors to bid up the stock price to higher levels in response to positive news. The extent of mispricing is even greater in the presence of noise traders (De Long, Shleifer, Summers, and Waldmann (1990)) whose activities amplify the bullish signal.

The behavioral explanation suggests that the size effect in acquisition gains arises from the tendency of the market to overreact to news (DeBondt and Thaler (1994)) and limits to arbitrage (Barberis and Thaler (2003), Shleifer and Vishny (1997)). Behavioral finance would argue that when the acquisition is interpreted as positive news by the market, stocks with costlier arbitrage – such as the shares of small acquirers – will experience a greater positive overreaction, because costly short sales deter arbitrageurs from taking contrarian positions around the event.

This paper presents empirical results for testing the Coasian and the behavioral explanations of the size effect in acquisition gains.

I employ two measures of firm size: a categorical variable that accommodates industry variation in optimal firm size by classifying an acquirer as "small" if its total assets fall at or below 40th percentile of the industry asset distribution and "large" if its total assets fall at or above the 60th percentile, and the log of the acquirer's total assets as a second measure of acquirer size. In order to exclude the impact of variation around the mean on the results, these tests exclude acquirers whose asset size is between the 40th and the 60th percentiles of the industry-year median.

Next, I investigate how the impact of acquirer size on shareholder gains varies by the organizational form of the target and the form of payment. The results suggest that the difference in abnormal returns between small and large acquirers' announcements prevails only in acquisitions of private and subsidiary targets. These announcements are good news to the market: they generate significantly positive shareholder gains. Mean (median) three-day abnormal returns are 1.9% (0.9%) in all acquisitions of private and subsidiary targets, 3.8% (1.7%) among small firms, and 1.0% (0.7%) among large firms. Shareholder gains do not differ significantly among small and large acquirers in acquisitions of public targets that generate significantly negative announcement abnormal returns.

I assess the empirical validity of the Coasian explanation from two perspectives: the economic efficiency of acquisition decisions and overpayment for the target firm. If an optimal range of firm size exists, then firms below the optimal range are likely to have greater potential to increase productivity by growing via acquisitions, hence their acquisition decisions can create greater fundamental shareholder value.

I gauge fundamental shareholder value creation by two metrics: the change in operating return on assets as an indicator of productivity improvements and the change in

sales growth in the two postmerger fiscal years relative to the two premerger fiscal years. Univariate results show that small acquirers experience better operating efficiency and greater sales growth than large acquirers. However, postmerger efficiency gains become statistically insignificant in multivariate event study regressions with three-day abnormal returns as the dependent variable, while the impact of acquirer size persists. These findings suggest that differences in postmerger efficiency gains do not explain the effect of acquirer size on shareholder gains.

Another plausible hypothesis of lower announcement abnormal returns accompanying acquisition announcements at large firms is managerial hubris. Moeller, Schlingemann, and Stulz (2004) find that large acquirers pay greater deal premiums for their targets. Deal premium is calculated as total deal value over the target firm's market capitalization prior to the acquisition announcement, hence it is restricted to transactions where the target is a publicly listed firm. Since acquisitions of public targets differ from acquisitions of private and subsidiary targets along several dimensions, the extrapolation of this measure is not straightforward. A high deal premium could arise either because the bidder pays a greater excess amount over the target's fair market value for controlling the target's assets or because the target's equity is temporarily undervalued by the market, but the target's shareholders negotiate a price that reflects the higher long-term valuation. The deal premium may also be affected by differences in the capital structure of the target firm as the acquirer takes over not only the target's assets but also its debt. For example, if the target has high leverage, the final merger agreement between the acquirer and the target may specify that some of the funds are used by the target to repay outstanding debt to improve its balance sheet.

I introduce a novel measure for the target premium that is available for private and subsidiary targets and is not affected by the target's capital structure: the change in acquirer goodwill as a fraction of total deal value. FASB Statement of Financial Accounting Standard 141(R) on Business Combinations requires acquirers to record the excess payment over the fair value of net assets (i.e. assets minus liabilities), as goodwill[1] .

Estimation of fair market values, and recording the excess as goodwill, is subject to stringent audit requirements. Hence, if a large fraction of the compensation is recorded as goodwill, it implies that the acquirer paid a substantial premium for the target either in expectation of substantial match-specific synergies or owing to managerial hubris.

The results are inconsistent with the hypothesis that the effect of acquirer size on shareholder gains would be related to the target premium. Although univariate tests show that acquirers tend to pay greater premiums for their targets, the impact ceases to be significant in multivariate regressions of shareholder gains on deal and firm characteristics. Further, controlling for the target premium does not affect the coefficient on acquirer size in multivariate event study regressions. Hence, the acquirer size effect on shareholder gains does not arise from differences in overpayment for the target.

Next, I explore the validity of the behavioral explanation of the effect of acquirer size on value creation, in particular the relationship between limits to arbitrage and the size effect in acquisition gains.

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[1] Paragraph 34 of SFAS 141(R) states:
"The acquirer shall recognize goodwill as of the acquisition date, measured as the excess of (a) over (b) below:
a. The aggregate of: (1) The consideration transferred measured in accordance with this Statement, which generally requires acquisition-date fair value (paragraph 39) (2) The fair value of any noncontrolling interest in the acquiree (3) In a business combination achieved in stages, the acquisition-date fair value of the acquirer's previously held equity interest in the acquiree.
b. The net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed measured in accordance with this Statement."

Behavioral finance argues that agents in financial markets are not fully rational (Barberis and Thaler (2003) provide an excellent review of the literature). In markets populated by both rational and irrational traders, the trading activities of irrational noise traders may lead to mispricing of the securities. Rational agents' trading decisions may not correct such mispricing in the short-term due to arbitrage implementation costs and noise trader risk.

Antweiler and Frank (2006) examine how stock prices react to positive and negative news. They document a significant predictable drift in stock prices starting two days after the news event in the opposite direction from the original market reaction to the news. The typical reaction to news stories is a prompt strong jump in stock prices followed by a gradual reversal. This reversal implies that the market tends to overreact to news events.

I hypothesize that the magnitude of market overreaction to news – relative to the price adjustment justified by the new information – depends on the efficiency of the price formation process.

Since the price efficiency of stocks that face short-selling constraints is lower than those that do not face short-selling constraints (Saffi and Sigurdsson (2011), Boehmer and Wu (2013)), I conjecture that the positive news carried by the acquisition announcement induces a larger overreaction in the case of shares with limited short-selling.

Short-selling limitations cannot be measured directly, because the volume of short positions that would prevail if short-selling was freely available, is unobservable. I gauge short-selling constraints by the idiosyncratic volatility of the acquirer's shares based on Pontiff (1996) and (2006) documenting that idiosyncratic volatility represents the highest

cost faced by arbitrageurs that discourages rational traders from taking short positions.

My results indicate that announcements made by acquirers whose shares are subject to greater short-selling constraints generate significantly greater short-term abnormal returns than those that are not, regardless of the size of the firm. I also find that announcements of acquirers with costly short sales are accompanied by significantly greater abnormal trading volume (calculated following Bamber (1987)) and lower short interest in the three event days. Greater abnormal returns for acquirers with costly short-sales are followed by greater subsequent reversals, providing further support for the overreaction hypothesis.

A steady pattern emerges from the data: as the market responds to the good news of the acquirer's announcement to buy a private or subsidiary target, shares with costlier short sales respond with greater abnormal trading turnover. The buying pressure leads to greater abnormal returns followed by correspondingly larger reversals in the subsequent month.

As a final test, I introduce a control for the cost of short-selling, proxied by the idiosyncratic volatility of the acquirer's shares to the event study regressions of shareholder gains on firm and deal characteristics. The results indicate that the coefficient on idiosyncratic volatility subsumes the effect of acquirer size in the regressions and improves the overall fit.

I conclude that the impact of acquirer size on shareholder gains in corporate acquisitions reflects investor overreaction associated with costly short sales limiting arbitrage. Although fundamental differences exist among small and large acquirers, these are not driving the effect of firm size on shareholder gains.

My paper makes contributions to the literature on the relationship between market frictions and shareholder gains in corporate events. First, my results document that the effect of firm size on shareholder gains in event studies is driven by limits to arbitrage. This finding has an important implication: short-selling constraints play a statistically significant role in measured event study returns. Failing to control for this market friction may lead to biased coefficients on other independent variables and a misinterpretation of the evidence regarding shareholder gains.

My results also provide direct evidence on the link between short-selling constraints and market overreaction to good news. Miller (1977) establishes that short-selling tends to moderate the tendency of the stock price to be bid up to higher levels as it allows investors with pessimistic views to trade on their valuation. My results attest to Miller's argument and show that the initial overreaction to good news in the case of shares with costly short sales is associated with greater abnormal buying pressure and it is followed by larger reversals.

Finally, my results clarify that the effect of acquirer size on shareholder gains in acquisitions of private and subsidiary targets is independent from systematic differences in postmerger efficiency gains, or the degree of overpayment for the target's assets.

The remainder of the paper proceeds as follows: Chapter 2 provides a review of the literature that forms the context of my study. Chapter 3 describes the sample and reports how shareholder gains differ along firm size and the organizational form of the target. Chapter 4 reports the results and Chapter 5 concludes the paper.

CHAPTER 2

RELATED LITERATURE

My dissertation makes contributions to the literature on corporate acquisitions and the relationship between market frictions and event study results.

The corporate finance literature recognizes that firm size is a significant determiant of abnormal returns in acquisition events. Moeller, Schlingemann, and Stulz (2004) document that the wealth of small acquirers' shareholders increases by about 2% more than that of large acquirers in three days surrounding acquisition announcements. Their findings indicate that large acquirers pay higher deal premiums for public targets, leading to the interpretation that overpayment for the target makes large firm's acquisition decisions less efficient, resulting in lower shareholder gains upon the announcement. In studies examining the role of corporate governance in shareholder value creation Masulis, Wang, and Xie (2007), Offenberg (2009), Faccio, McConnell, and Stolin (2006), and Harford, Humphery-Jenner, and Powell (2012) report negative coefficients on firm size in multivariate regressions of shareholder gains. Intuitively, if small acquirers' acquisitions were more efficient, then these firms would experience better postmerger economic performance leading to higher operating earnings and improved stock returns. However, Ben-David and Roulstone (2008) report that calendar time portfolios formed of small acquirers' shares underperform those of large acquirers in the 12 and 36 months

postmerger period, and this underperformance is particularly strong among stock-financed acquisitions. I find that differential shareholder gains among small and large acquirers arise in acquisitions of private and subsidiary targets. Acquisition announcement shareholder gains do not differ significantly in acquisitions of public targets.

My results indicate that the effect of acquirer size on shareholder gains is independent from postmerger efficiency gains and the overpayment for the target firm. Univariate results show that large acquirers tend to pay greater target premiums and incur lower postefficiency gains than small acquirers. However, the controls for the target premium and changes in postmerger performance are statistically insignificant in multivariate event study regressions and do not affect the magnitude and significance of the coefficient on acquirer size, implying that the size effect arises from other sources.

The paper also contributes to the behavioral finance literature on providing evidence that limits to arbitrage contribute to market overreaction, leading to temporary mispricing of securities. Miller (1977) shows that short-selling constraints induce an upward bias in the equilibrium price by excluding pessimistic traders' views from the price formation process. De Long et al. (1990) model how the unpredictability of noise traders' beliefs can make arbitrage ineffective and deter smart money arbitrageurs from driving the stock price to the stock's fundamental value in the short-term. In analyzing the closed-end fund discount, Pontiff (1996) documents that idiosyncratic risk is the largest cost of holding a security and it is strongly related to the level of mispricing. Shleifer and Vishny (1997) model how specialized arbitrageurs are discouraged from taking positions in securities with high idiosyncratic risk if short-selling requires resources for maintaining a risky margin position. Pontiff (2006) demonstrates that rational arbitrageurs will assign lower optimal

weights to securities with high idiosyncratic risk even if their capital is not limited, therefore these securities are more prone to mispricing. Ang et al. (2006) find a strong negative relationship between idiosyncratic volatility and average returns. Using short-rebate fees to estimate short-selling costs, Drechsler and Drechsler (2014) document that stocks that are expensive to short carry a premium net of the short-selling fees and capture a substantial fraction of anomaly returns.

I document that short-selling limitations have a substantial impact on abnormal returns in event studies when the event is associated with stock price increases. Specifically, my results provide empirical evidence in support of Miller (1977) and De Long, Shleifer, Summers, and Waldmann (1990) that short-selling limitations induce a market overreaction followed by a corresponding reversal as the price gradually adjusts to fundamental expectations.

CHAPTER 3

SAMPLE DESCRIPTION

My sample includes completed mergers and acquisitions of US targets between 1988 and 2014 from the SDC Mergers and Acquisitions database matched to CRSP and Compustat. Targets are restricted to public companies, private companies, and subsidiaries of public companies. I require CRSP return information for the year preceding the acquisition announcement and Compustat data for at least five fiscal years: the effective fiscal year of the acquisition and two preceding and two subsequent fiscal years. I set the minimum deal value, defined as the total consideration paid by the acquirer excluding fees and related expenses, to $10 million and drop transactions where the deal value relative to the market capitalization of the acquirer 11 days before the announcement is less than 1%. In order to avoid repeat partial acquisitions, I require that the acquirer controls less than 50% of the target before the acquisition and obtains 100% ownership. I exclude transactions with missing information on the announcement date, effective date, deal value, target organizational form, or payment form. These procedures result in 8,802 acquisitions. I assign acquirers to 48 industry groups defined in Fama and French (1997) based on their primary SIC codes in Compustat in the fiscal year of the acquisition.

The Coasian theory of the firm implies that the tradeoff between production by internal coordination and outsourcing from the market determines a range of optimal firm

sizes. Intuitively, this depends on the nature of core activities: the optimal asset size is larger for firms in heavy manufacturing industries than in service industries. Hence, I classify an acquirer as "small" if its total assets fall at or below the 40th percentile and "large" if its total assets fall at or above the 60th percentile of the industry asset distribution. In order to avoid potential ambiguity coming from variations around the median, I intentionally omit firms from these size categories whose total assets fall between the 40th and 60th percentiles. As a second measure, I employ the log of acquirer total assets as a continuous indicator of firm size.

Table 1 shows the summary statistics for the sample. Firm characteristics are measured at the beginning of the fiscal year of the acquisition announcement.

Small and large acquirers do not differ significantly in Tobin's Q measures calculated as the market to book assets ratio defined in Adam and Goyal (2008). As Tobin's Q proxies for the firm's growth opportunities, this finding implies that no clear relationship exists between a firm's growth opportunities and its size. On the other hand, small acquirers have lower equity market valuations and lower operating efficiency than large acquirers, suggesting a larger scope of potential productivity improvements.

In agreement with the literature reporting a negative relationship between firm size and financial constraints (e.g. Kaplan and Zingales (1997), Whited and Wu (2006), Hadlock and Pierce (2010)), small acquirers have lower leverage ratios than large acquirers. At the same time, they have greater levels of excess cash measured as cash reserves over the predicted industry-year median (as specified in Harford (1999)) suggesting that small acquirers have been actively accumulating cash reserves to finance acquisition plans.

Relative deal size, deal value as a fraction of the acquirer's prior market capitalization, is indicative of the economic magnitude of investment. Given the same net present value of an investment, the acquisition of a particular target will result in greater size adjusted gains for small acquirers than a large ones (Asquith, Bruner, and Mullins (1983)). I find that small acquirers make deals that are of substantially greater relative size than those made by large acquirers, implying that greater shareholder value creation is partly due to adding larger assets.

Private and subsidiary firms constitute a greater fraction of targets chosen by small acquirers (88%) than large acquirers (75%). In light of the greater profitability of these acquisitions (Chan (1998), Faccio, McConnell, and Stolin (2006)), I conjecture that this difference is a meaningful contributor to greater shareholder value creation. On the other hand, small acquirers tend to finance a greater proportion of their acquisitions by stock payment, which could lessen shareholder gains, particularly for cash-rich acquirers (Jensen (1988), Harford (1999)).

I find substantial differences in the market microstructure characteristics of small and large acquirers' shares. Small acquirers' shares are significantly less liquid than those of their large peers (Demsetz (1968), Amihud (2002)), and they have greater idiosyncratic volatility, which implies costlier short sales (Pontiff (1996) and (2006), Stambagh, Yu, and Yuan (2015)). Following Ang, Hodrick, Xing, and Zhang (2006) I measure idiosyncratic volatility as the standard deviation of the daily abnormal returns over the Fama-French three-factor model during the 200-day period ending on the sixth day before the acquisition announcement using estimation parameters from annual Fama-McBeth regressions. Average and median idiosyncratic volatilities of the shares of small acquirers (3.7% and

3.2%, respectively) are more than 50% greater than those of large acquirers (2.3% and 2.0%, respectively).

Table 2 shows the analysis of shareholder gains by the organizational form of the target and method of payment. Announcement abnormal returns are measured as three-day cumulative residuals over the Fama and French three-factor model estimated over a 200-day period that ends on the sixth day preceding the acquisition news. Panel A.1 reports univariate differences in shareholder gains among small and large acquirers in the three-day event period surrounding the announcement. Small acquirers' announcements generate substantially greater announcement returns in the case of private and subsidiary targets, but not in the case of public targets. There are two major differences between acquisitions of public and nonpublic targets. First, acquisitions of private and subsidiary targets generate significantly positive announcement returns regardless of the form of payment, whereas acquisitions of public targets generate negative announcement returns in the case of stock or mixed payment, and just slightly positive returns in the case of cash payment. Consequently, acquisitions of private and subsidiary targets are definitely good news to the market, whereas acquisitions of public targets tend to be bad news. Second, announcements of acquisitions of private targets are accompanied by less public information than announcements of public targets: there is lower competition for the target firm and negotiations during the bidding process result in greater sharing of information between the management and the target firm without public disclosures (Chang (1998)). Thus, in the case of private and subsidiary targets, the market recognizes the good news, but its information set about the particular drivers of profitability is more limited.

Table 3 shows three-day cumulative abnormal announcement returns combined

with the twenty-two-day cumulative reversals following the event period. Interestingly, the difference in shareholder gains in the case of private and subsidiary targets prevails even after combining shareholder gains in the three-day event period with the twenty-two-day reversal period.

Table 4 presents separate regressions of shareholder gains on acquirer size for public, private, and subsidiary target acquisitions. The findings confirm the results in Table 3: acquirer size is a significant determinant of shareholder gains in acquisitions of private and subsidiary targets, but not in acquisitions of public targets by both tests. Table 5 illustrates that these results are robust to using the Hoberg-Phillips textual industry classifications based on product-market similarities. Hence, the impact of acquirer size in the overall sample originates from the subsample of acquisitions of private and subsidiary targets, which make up 79% of the total number of acquisitions.

Table 6 discusses the effect of target choice on shareholder gains holding constant the size of the acquirer and relative deal size. The results document that acquisitions of public targets carry bad news and acquisitions of private and subsidiary targets carry good news to the market even after controlling for the magnitude of investment and the size of the acquiring firm. Table 7 confirms that these results are robust to using the Hoberg-Phillips product-market similarity algorithm for industry classifications with 50 industry categories, rather than the Fama-French 48 industriesd defined on the basis of SIC (NAICS) codes.

Table 1

Descriptive Statistics

This table contains averages and medians (in parentheses) for the sample. Acquirers are classified small if their total assets at the beginning of the fiscal year of the acquisition are at or below the 40th percentile for the industry distribution and large if those are at or above the 60th percentile. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.
Firm characteristics reflect values at the beginning of the fiscal year of the acquisition announcement. Relative deal size is measured as total deal value over the acquirer's maket capitalization. Excess cash represents deviation of cash holdings from the industry-year median prediction following Harford (1999). Idiosyncratic volatility is measured as the standard deviation of daily abnormal returns relative to the Fama-French 3-factor model in the 200 day time period ending on the 6th day before the acquisition announcement. Illiquidity is measured over the 12 months preceding the acquisition announcement by the Amihud measure using monthly average returns and prices. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix.

Table 1 continued

Variable	All	Small	Large	Signi-ficance
Total assets (USD million)	11,153	222	13,089	***
	(990)	(88)	(1,971)	***
Market value of equity (USD million)	8,841	257	12,160	***
	(1,157)	(116)	(2,280)	***
Tobin's Q	2.06	2.03	2.10	
	(1.55)	(1.52)	(1.58)	*
Market to book equity	3.42	3.21	3.55	***
	(2.45)	(2.11)	(2.59)	***
Operating return on assets	13.1%	7.8%	14.3%	***
	(13.4%)	(11.9%)	(13.7%)	***
Sales growth	25.6%	23.9%	24.8%	
	(13.3%)	(11.9%)	(13.1%)	***
Leverage (Book)	19.7%	15.4%	20.4%	***
	(16.7%)	(7.4%)	(17.9%)	***
Excess cash	0.7%	6.8%	-1.2%	***
	(-1.1%)	(1.2%)	(-2.0%)	***
Relative deal size	27.7%	66.6%	18.7%	***
	(8.5%)	(32.6%)	(5.3%)	***
Fraction of cash deals	32.2%	20.6%	34.9%	***
Fraction of diversifying deals	41.7%	42.3%	42.4%	
Fraction of public targets	21.2%	12.1%	24.8%	***
Fraction of private targets	42.8%	56.0%	39.2%	***
Fraction of subsidiary targets	35.9%	31.7%	35.9%	***

Table 1 continued

Variable	All	Small	Large	Signi-ficance
Idiosyncratic volatility	2.6%	3.7%	2.3%	***
	(2.2%)	(3.2%)	(2.0%)	***
Illiquidity (Amihud measure)	0.195	1.049	0.032	***
	(0.002)	(0.060)	(0.001)	***
Number of observations	8,802	1,117	6,306	

Table 2

Summary of Three-Day Cumulative Announcement Abnormal Returns

This table shows the average and the median three-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Median values are placed below the means in parentheses. Small acquirers are those whose total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution in a given fiscal year, whereas large acquirers are those whose total assets were at or above the 60th percentile. If 100% of the consideration for the target took place in cash, I classify the transaction as a cash payment transaction, otherwise I classify it as stock and mixed payment transaction. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the small and the large group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. Abnormal returns are significantly different from zero in all categories.

Table 2 continued

	All	Small	Large	Signi-ficance
All Targets, All Payment Forms	1.2%	3.1%	0.7%	***
	(0.6%)	(1.5%)	(0.4%)	***
Number of observations	8,802	1,117	6,306	
All Targets, Cash Payment	1.2%	3.1%	0.9%	***
	(0.7%)	(1.6%)	(0.6%)	***
Number of observations	2,837	230	2,205	
All Targets, Stock Payment	1.2%	3.1%	0.6%	***
	(0.6%)	(1.5%)	(0.4%)	***
Number of observations	5,965	887	4,101	
Public Targets, All Payment Forms	-1.1%	-1.8%	-1.1%	
	(-0.5%)	(-0.4%)	(-0.5%)	
Number of observations	1,869	136	1,564	
Public Targets, Cash Payment	0.5%	2.0%	0.4%	
	(0.2%)	(2.1%)	(0.2%)	*
Number of observations	592	20	536	
Public Targets, Stock Payment	-1.9%	-2.5%	-1.8%	
	(-1.3%)	(-0.7%)	(-1.3%)	
Number of observations	1,277	116	1,028	

Table 2 continued

	All	Small	Large	Signi-ficance
Private and Subsidiary Targets, All Payments	1.9%	3.8%	1.3%	***
	(0.9%)	(1.7%)	(0.7%)	***
Number of observations	6,933	981	4,742	
Private and Subsidiary Targets - Cash Payment	1.4%	3.2%	1.0%	***
	(0.8%)	(1.5%)	(0.7%)	***
Number of observations	2,245	210	1,669	
Private and Subsidiary Targets - Stock payment	2.1%	3.9%	1.5%	***
	(1.0%)	(1.8%)	(0.8%)	***
Number of observations	4,688	771	3,073	

Table 3

Summary of Twenty-Five-Day Cumulative Announcement Abnormal Returns

This table shows the average and the median twenty-five-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Median values are placed below the means in parentheses. Small acquirers are those whose total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution in a given fiscal year, whereas large acquirers are those whose total assets were at or above the 60th percentile. If 100% of the consideration for the target took place in cash, I classify the transaction as a cash payment transaction, otherwise I classify it as stock and mixed payment transaction. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the small and the large group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. Abnormal returns are significantly different from zero in all categories.

Table 3 continued

	All	Small	Large	
All Targets, All Payment Forms	-0.47%	0.60%	-0.68%	***
	(-0.25%)	(0.49%)	(-0.37%)	**
Number of observations	8,614	1,103	6,306	
All Targets, Cash Payment	0.34%	2.26%	-0.03%	***
	(0.41%)	(1.32%)	(-0.20%)	*
Number of observations	2,778	227	2,164	
All Targets, Stock Payment	-0.87%	0.17%	-1.04%	**
	(-0.54%)	(0.29%)	(-0.64%)	**
Number of observations	5,836	876	4,000	
Public Targets, All Payment Forms	-2.34%	-2.27%	-2.00%	
	(-1.59%)	(-3.21%)	(-1.41%)	
Number of observations	1,827	132	1,528	
Public Targets, Cash Payment	-0.27%	-1.43%	-0.4%	
	(-0.54%)	(-4.98%)	(-0.37%)	*
Number of observations	578	19	524	
Public Targets, Stock Payment	-3.3%	-2.42%	-3.03%	
	(-2.49%)	(-2.62%)	(-2.38%)	
Number of observations	1,249	113	1,004	
Private and Subsidiary Targets, All Payments	0.02%	0.99%	-0.25%	**
	(0.11%)	(0.58%)	(0.01%)	**
Number of observations	6,787	971	4,636	
Private and Subsidiary Targets - Cash Pmt	0.50%	2.59%	-0.03%	***
	(0.61)	(1.62%)	(0.41%)	**
Number of observations	2,200	208	1,640	

Table 3 continued

	All	Small	Large
Private and Subsidiary Targets - Stock Payment	-0.20%	0.55%	-0.38%
	(-0.14%)	(0.40%)	(-0.26%)
Number of observations	4,584	763	2,996

Table 4

Announcement Abnormal Returns and Acquirer Size

with 48 Fama-French Industries

This table reports the effect of acquirer size on three-day cumulative announcement abnormal returns. Two alternative measures of size are used: an indicator for small acquirers and the log of the acquirer's total assets. Three-day CARs are estimated using the the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Public Targets		Private Targets		Subsidiary Targets	
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	6.00	3.89	5.71 ***	9.78 ***	0.82	5.56 ***
	(0.41)	(0.56)	(0.00)	(0.00)	(0.50)	(0.00)
Small Firm	-0.87		2.48 ***		2.48 ***	
	(0.38)		(0.00)		(0.00)	
Total Assets		0.15		-0.60 ***		-0.63 ***
		(0.21)		(0.00)		(0.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Acquirer Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs	1,700	1,869	3,101	3,770	2,622	3,163
Adjusted R^2	0.03	0.03	0.03	0.03	0.02	0.03

Table 5

Announcement Abnormal Returns and Acquirer Size

with 50 Hoberg-Phillips Product-Market Industries

This table reports the effect of acquirer size on three-day cumulative announcement abnormal returns. Two alternative measures of size are used: an indicator for small acquirers and the log of the acquirer's total assets. Three-day CARs are estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the announcement. Industry categories follow the Hoberg-Phillips (2010) clustering based on product-market similarities with 50 categories. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Public Targets		Private Targets	
	(1)	(2)	(3)	(4)
Intercept	-2.73 *	-5.14 ***	2.12	6.85 ***
	(0.08)	(0.00)	(0.26)	(0.00)
Small Firm	-1.41		2.07 ***	
	(0.22)		(0.00)	
Total Assets (Log)		0.24		-0.48 ***
		(0.11)		(0.00)
Year FE	Yes	Yes	Yes	Yes
Acquirer industry FE	Yes	Yes	Yes	Yes
Number of observations	1,386	1,530	2,639	3,216
Adjusted R-squared	0.02	0.03	0.02	0.03

Table 6

Announcement Abnormal Returns and Target Organizational Form

with 48 Fama-French Industries

This table shows the relationship between acquisition announcement three-day cumulative abnormal returns and the organizational form of the target firm. All regression specifications contain industry and year fixed effects. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All Targets		
	(1)	(2)	(3)
Intercept	3.99 *	2.79	2.43
	(0.06)	(0.18)	(0.25)
Public Target Indicator	-3.02 ***		
	(0.00)		
Private Target Indicator		0.99 ***	
		(0.00)	
Subsidiary Target Indicator			1.29 ***
			(0.00)
Small Firm Indicator	1.23 ***	1.59 ***	1.93 ***
	(0.00)	(0.00)	(0.00)
Relative Deal Size	1.46 ***	1.06 ***	0.97 ***
	(0.00)	(0.01)	(0.02)
Year FE	Yes	Yes	Yes
Acquirer Industry FE	Yes	Yes	Yes
Number of Observations	7,423	7,423	7,423
Adjusted R-Squared	0.05	0.03	0.03

Table 7

Announcement Abnormal Returns and Target Organizational Form

with 50 Hoberg-Phillips Product-Market Industries

This table shows the relationship between acquisition announcement abnormal returns and the organizational form of the target firm for the subsample where information was available on the acquirer's product-market cluster as described in Hoberg and Phillips (2010). All regression specifications contain industry and year fixed effects. Industry categories are based on product-market clusters with 50 categories. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All Targets		
	(1)	(2)	(3)
Intercept	3.71	3.00	3.16
	(0.17)	(0.27)	(0.24)
Public Target Indicator	-2.96 ***		
	(0.00)		
Private Target Indicator		1.02 ***	
		(0.00)	
Subsidiary Target Indicator			1.18 ***
			(0.00)
Small Firm Indicator	1.06 ***	1.41 ***	1.68 ***
	(0.00)	(0.00)	(0.00)
Relative Deal Size	1.24 ***	0.86 **	0.75 *
	(0.00)	(0.03)	(0.06)
Year FE	Yes	Yes	Yes
Acquirer Industry FE	Yes	Yes	Yes
Number of Observations	6,111	6,111	6,111
Adjusted R-Squared	0.05	0.02	0.03

CHAPTER 4

EMPIRICAL ANALYSIS

Shareholder Value Creation

Coase's theory of the firm proposes that diminishing marginal returns to management determine the optimal scope of the firm at the point where the marginal cost of internal coordination is equal to that of obtaining the input from the external market. In this framework, firms that are smaller than the optimal size for their business can obtain greater efficiency gains by acquisitions than their peers larger than the optimal size.

In exploring how the impact of acquirer size on shareholder gains reflects expected productivity differences among small and large acquirers, I consider three measures: excess payment for the target over the fair market value of its net assets, changes in operating return on assets, and changes in sales growth in the two postmerger fiscal years relative to the two premerger fiscal years. Moeller, Schlingemann, and Stulz (2004) document that large acquirers pay higher deal premiums for their targets than small acquirers. They posit that such overpayment implies greater managerial hubris at large firms and leads to less efficient acquisition decisions, and lower announcement abnormal returns. Deal premium is measured as the total deal value relative to the market capitalization of the target firm 50 days before the announcement. This information is only available for public targets hence the evidence is limited public target acquisitions.

I introduce a different measure: goodwill incurred from the acquisition in proportion to total deal value. FASB rules require acquirers to record excess payment over the fair value of net assets, as goodwill. Estimation of fair market values, and recording the excess as goodwill, is subject to stringent audit requirements, hence accounting for a large fraction of the compensation as goodwill implies a substantial target premium. Goodwill information is not available at the transaction level, thus as a proxy, I use the change in the acquirer's goodwill (less goodwill impairments and goodwill amortization) in the effective fiscal year of the acquisition as a proxy. Fuller, Netter, and Stegemoller (2002) report that frequent acquirers often make several acquisitions with substantially different deal characteristics within the same fiscal year. In order to avoid the ambiguity caused by multiple acquisitions, I restrict empirical tests on this measure of the target premium to the sample of acquirers that made a single deal per fiscal year. I gauge operating efficiency gains from the acquisition by the change in average operating return on assets and average sales growth in the two years that follow the effective fiscal year of the merger relative to the two years that precede it.

Table 8 shows the summary for the overall sample and subsamples of small and large acquirers. Univariate tests report that small acquirers pay lower premiums for their targets and they exhibit better asset utilization and sales growth in the two postmerger years relative to the two premerger years than large acquirers opening the possibility that the size effect in shareholder gains is related to higher productivity gains. In contrast to the univariate differences, multivariate regressions in Tables 9 and 10 refute the hypothesis that the effect of acquirer size on shareholder gains is significantly related to differential changes in postmerger productivity: once we control for the magnitude of the investment

and acquirer size, the coefficients on postmerger improvements in operating efficiency and sales growth are insignificant.

All regression models in Tables 9 and 10 include industry and time fixed effects and report standard errors clustered by acquirer. Column (1) demonstrates that excess payment appear to have a significant negative effect, while improvements in economic efficiency appear to have a significant positive impact on shareholder gains if we do not control for relative deal size. However, column (2) reports that controlling for relative deal size absorbs the impact of operating synergies and decreases the significance of the target premium. While the positive market reaction to acquisitions of private and subsidiary targets reflects that these investments generally improve operating performance, the scope of attainable efficiency gains is determined by the magnitude of the investment. Column (3) shows the regressions without controlling for the target premium and synergy measures in order to evaluate the association between the impact of acquirer size vis á vis the impact of productivity improvements. The results document that the significance and magnitude of the coefficient on acquirer size is not materially affected by inclusion or omission of control variables for operating synergies and the fit of the regression remains unchanged, consequently the effect of firm size on shareholder gains is independent from the target premium and differences in operating synergies.

Table 10 shows that these results are robust to using 50 industry clusters based on product-market similarities as described in Hoberg and Phillips (2010) rather than the Fama-French 48 industry categories based on the primary SIC / NAICS code of the acquirer.

Short Selling Constraints

Acquirer Size and the Cost of Short-Selling

The relationship between acquirer size on shareholder gains in acquisitions of private and subsidiary targets is persistent over time and industries, but it is independent from differences in fundamental value creation. The alternative explanation posits that the effect of firm size reflects a persistent distortion in the short-term abnormal returns surrounding the acquisition announcement.

In the Miller (1977) model, limitations on short sales impact the way disagreement among traders is reflected in the equilibrium price: since traders with pessimistic valuations are not able to profit from their analysis by selling the shares short, riskier stocks surrounded by greater disagreement are bid up to higher prices. Such mispricing can reach a higher level if irrational noise traders are also present and they take bullish positions on the basis of the positive news (De Long, Shleifer, Summers, and Waldmann (1990)).

Small firms's shares have greater idiosyncratic volatility, lower liquidity, lower institutional ownership, and more information asymmetry than large firms. All of these factors present impediments to short-selling. Idiosyncratic volatility has been shown to have the strongest association with limited short-selling as arbitrageurs are dissuaded by the possibility that an adverse price movement during the holding horizon will eliminate their profits (Pontiff (1996) and (2006)). Stambaugh, Yu, and Yuan (2015) model the inherent asymmetry in arbitrage: arbitrageurs are more reluctant to take positions in high idiosyncratic volatility stocks when these are overpriced due to the maintenance margin requirement: if a price increase takes place during the horizon of the arbitrage transaction, arbitrageurs need to react immediately by increasing the capital tied up in the margin.

Motivated by these theories and the supporting empirical evidence, I employ idiosyncratic volatility as the proxy for short-selling constraints to test the hypothesis that market frictions are responsible for the effect of acquirer size on shareholder gains. Following Ang, Hodrick, Xing, and Zhang (2006) I calculate idiosyncratic volatility as the standard deviation of daily abnormal returns over those predicted by the Fama-French three factor model. Parameter estimates for calculating abnormal returns are based on annual Fama-McBeth regressions of daily returns on market returns with standard errors clustered at the firm level. Median idiosyncratic volatility is 2.28% for the overall sample, 3.24% for small acquirers, and 2.08% for large acquirers. I sort acquirers into high and low idiosyncratic risk categories based on whether the idiosyncratic volatility of their shares exceeds the median in the sample.

Tables 11-14 show comparisons of three-day cumulative abnormal announcement returns, cumulative reversal in the twenty-two trading days following the announcement period, three-day abnormal trading turnover, and short interest outstanding in the month of the announcement by the idiosyncratic volatility of the acquirer and firm size. I find statistically significant differences among acquirers with high and low idiosyncratic volatilities along all of these dimensions.

Table 11 reports that acquirers with high idiosyncratic volatility have significantly greater abnormal returns than their peers both in the overall sample and within the subsamples of small and large acquirers. I find that the majority of small acquirers (73.5%) has high idiosyncratic volatility, whereas the majority of large acquirers (58.5%) has low idiosyncratic volatility as benchmarked against the sample median. Acquirers in the high idiosyncratic volatility group experience substantially greater three-day cumulative

abnormal announcement returns than acquirers in the low idiosyncratic volatility group, regardless of their size.

Table 12 presents cumulative reversals in the twenty-two trading days following the event. I find substantial negative reversals in all categories corroborating the behavioral finance literature (e.g. DeBondt and Thaler (1985)) that investors overreact to news. Acquirers with high idiosyncratic volatility experience greater reversals than acquirers with low idiosyncratic volatility in all size groups. Taken together, greater abnormal announcement returns and larger postannouncement reversals lead to the conclusion that the impact of acquirer size on shareholder gains reflects larger market overreaction in the case of small acquirers.

I conjecture that the greater market overreaction arises from stronger price pressure. Small stocks are less liquid than large stocks (e.g. Amihud (2002)), hence the increase in demand associated with the positive news conveyed by the acquisition of a private or subsidiary target will generate greater abnormal trading volume. Greater increase in demand together with short-selling constraints will result in bidding up the stock price of small acquirers to a higher level.

Table 13 documents three-day cumulative abnormal trading turnover around the announcement[1] measured as the cumulative residuals in the three event days over predicted trading volume. Prediction parameters are based on the preceding 12-month period following Bamber (1987). Trading turnover is calculated as the ratio of daily shares volume (divided by half) to the total number of shares outstanding. The announcement generates significantly greater abnormal trading turnover for acquirers whose idiosyncratic

[1] Note: trading turnover information was missing for 110 observations in the CRSP volume data, so these transactions are not included in the comparisons in Panel C of Table 4.

risk is above the group median than those below the group median in all categories. Small acquirers experience greater abnormal trading turnover than large acquirers, which corresponds to the underlying associations between size, idiosyncratic risk, and illiquidity.

Short-selling constraints cannot be measured directly by the actual outstanding short interest, as short interest that would prevail in the absence of all short-selling constraints is unobservable, even though we expect that short-selling constraints and actual short positions are negatively related. Table 14 confirms stocks with high idiosyncratic volatility have significantly lower short interest outstanding in the month of the acquisition than stocks with low idiosyncratic volatility in all categories. It is important to note that the Compustat file provides monthly (or in recent years biweekly) reported short interest: the number of shares that are in outstanding short positions. Blau, Van Ness, and Van Ness (2011) show that the correlation between the outstanding short interest and short trading volume is only 45%.

Altogether greater abnormal trading turnover and lower short interest indicate a greater buying pressure in the case of acquirers whose shares are costlier to sell short, confirming the relationship between short-selling constraints and greater market overreaction to positive news. These results support the hypothesis that the impact of acquirer size on shareholder gains in corporate acquisitions results from limits to arbitrage rather than a greater scope of shareholder value creation in firms below the optimal size.

Shareholder Gains, Acquirer Size, and Idiosyncratic Risk

The univariate results support a limits-to-arbitrage explanation of the relationship between acquirer size and announcement abnormal returns. To explore this argument in

more detail, I conduct multivariate regressions with controls for other determinants of shareholder value creation.

Tables 15 and 16 discuss determinants of shareholder gains in acquisitions of private and subsidiary targets. Table 15 contains multivariate regressions of shareholder gains on acquirer size and relative deal size with and without controlling for the proxy for the short-selling cost of the shares of the acquiring. All regressions contain time and industry fixed effects and report standard errors clustered by the acquiring firm. The coefficient on idiosyncratic volatility as the proxy for costly short sales subsumes the coefficient of acquirer size on shareholder gains, implying that the impact of acquirer size on abnormal returns originates from limits to arbitrage. Table 16 confirms that these results are robust to using a flexible industry categorization based on textual analysis of product market similarities (Hoberg and Phillips (2010)) rather than the 48 Fama-French industries based on the primary SIC or NAICS code of the firm. In Table 17, idiosyncratic volatility of the shares of the acquirer as a proxy for short-selling costs is replaced by the actual volume of short interest outstanding in the month of the acquisition announcement. The coefficient on the actual short-selling volume is insignificant in the regression.

Table 18 and 19 report the results of cross-sectional analysis with the full set of control variables. Acquirer characteristics are measured in the beginning of the fiscal year of the acquisition announcement. Excess cash refers to cash holdings over the predicted level for the industry and fiscal year based on macroeconomic and firm-specific variables following Harford (1999). Illiquidity refers to the average Amihud measure calculated from monthly prices and returns in the 12 months preceding the month of the acquisition announcement. Target premium refers to the fraction of total deal value recorded as

goodwill. Cash transactions include those where 100% of the payment took place in cash. A deal is classified as a diversifying acquisition if the target belonged to a different Fama-French 48 industry category than the acquirer based on its primary SIC code prior to the acquisition. All regressions include time and industry fixed effects and report standard errors clustered by the acquiring firm.

Columns (1) and (3) show results for the subsample of acquirers where information is available on the target premium measured as the fraction of goodwill to the total deal value, because the acquirer makes a single deal in a fiscal year. Fuller, Netter, and Stegemoller (2002) document that frequent acquirers' acquisitions often have various deal characteristics. Different levels of the excess payment would lead to ambiguity in the measure of target premium, hence this subsample includes acquirers who made a single acquisition in the fiscal year. Columns (2) and (4) show the results for the full sample of acquisitions of private and subsidiary targets.

Idiosyncratic volatility and relative deal size exert a statistically significant impact on shareholder gains in all specifications, while the other variables are either statistically insignificant in some or all of the regression specification models. The coefficient on the idiosyncratic volatility of acquirer shares as the proxy for short selling limitations subsumes the coefficient on acquirer size. This regularity is consistent with the interpretation that small acquirers experience larger abnormal announcement returns not because they have a greater scope for profitability improvements, but because their shares face costlier short sales, thus the greater buying pressure resulting from the market's reaction to the positive news leads to a higher temporary overreaction by the market.

Table 19 shows that these results are robust to using a more flexible industry

categorization based on textual analysis of product market similarities (Hoberg and Phillips (2010)) rather than the 48 Fama-French industries based on the primary SIC or NAICS code of the acquiring firm. Table 20 reports that the results are not robust to using the actual volume of short interest outstanding in the month of the acquisition announcement as the proxy for short-selling constraints. This is not surprising in light of the fact that short-selling constraints differ across firms, hence actual short sale volumes do not reflect the volume of short-selling that would prevail in their absence.

Table 8

Firm Size and the Economic Efficiency of Acquisitions

This table shows average and median differences in performance measures related to acquisitions of private and subsidiary targets. Target premium is measured as the change in goodwill net of goodwill amortization and impairment, recorded in the effective year of the merger as a fraction of the total deal value. Target premium is calculated for acquirers that made a single acquisition in the fiscal year to avoid ambiguity stemming from multiple deals with different deal characteristics in a fiscal year. Changes in operating return on assets and sales growth are evaluated by the difference between the averages of the two postmerger and the two premerger fiscal years (thus excluding the effective fiscal year of the acquisition). Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	Small	Large	t and z stats	Signi-ficance
Target Premium	54.5%	31.8%	67.1%	-4.4	***
	(5.0%)	(3.6%)	(5.7%)	(-1.7)	*
Number of Observations	4,301	762	2,718		
Changin in Operating ROA	-1.4%	0.3%	-1.7%	8.1	***
	(-0.9%)	(-0.6%)	(-0.8%)	(4.7)	***
Number of Observations	8,802	1,117	6,306		
Change in Sales Growth	-5.1%	8.8%	-7.7%	9.7	***
	(-1.6%)	(6.1%)	(-2.5%)	(10.80)	***
Number of Observations	8,802	1,117	6,306		

Table 9

Shareholder Gains, Economic Efficiency, and Acquirer Size

with 48 Fama-French Industries

This table shows how target premium and operating synergies affect shareholder gains upon the announcement of the acquisition. The sample includes acquisitions of private and subsidiary targets where the target premium could be calculated. The dependent variable is the three-day cumulative abnormal returns over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1), (2), and (3) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60^{th} percentile. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition. Columns (4), (5), and (6) include all observations. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 9 continued

	Private and Subsidiary Targets					
	(1)		(2)		(3)	
Intercept	7.34	***	3.93	***	3.82	***
	(0.00)		(0.00)		(0.00)	
Target Premium	-0.08	**	-0.06	*		
	(0.04)		(0.09)			
Change in Operating ROA	3.69	*	1.62			
	(0.10)		(0.46)			
Change in Sales Growth	0.96	**	0.46			
	(0.04)		(0.33)			
Total Assets (Log)	-0.65	***	-0.27	***	-0.28	***
	(0.00)		(0.00)		(0.00)	
Relative Deal Size			3.42	***	3.53	***
			(0.00)		(0.00)	
Year FE	Yes		Yes		Yes	
Acquirer Industry FE	Yes		Yes		Yes	
Number of Observations	4,301		4,301		4,301	
Adjusted R-Squared	0.03		0.07		0.07	

Table 10

Shareholder Gains, Economic Efficiency Indicators, and Acquirer Size

with 50 Hoberg-Phillips Product-Market Industries

This table shows the robustness checks for the regression models in Table 9 using 50 industry clusters based on product-market similarities as described in Hoberg and Phillips (2010) for the subsample of observations where this information is available. The sample includes acquisitions of private and subsidiary targets where the target premium could be calculated. The dependent variable is the three-day cumulative abnormal returns over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1), (2), and (3) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60^{th} percentile. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition. Columns (4), (5), and (6) include all observations. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 10 continued

	Private and Subsidiary Targets					
	(1)		(2)		(3)	
Intercept	8.18	**	5.00		5.02	
	(0.02)		(0.14)		(0.14)	
Target Premium	-.08	*	-.071	*		
	(0.05)		(0.09)			
Change in Operating ROA	3.90		2.13			
	(0.13)		(0.39)			
Change in Sales Growth	0.83		0.47			
	(0.15)		(0.42)			
Total Assets (Log)	-0.59	***	-0.28	***	-0.29	***
	(0.00)		(0.00)		(0.00)	
Relative Deal Size			2.98	***	3.08	***
			(0.00)		(0.00)	
Year FE	Yes		Yes		Yes	
Acquirer Industry FE	Yes		Yes		Yes	
Number of Observations	3,455		3,455		3,455	
Adjusted R-Squared	0.03		0.05		0.05	

Table 11

Announcement Abnormal Returns and Idiosyncratic Volatility

This table reports the average and median (in parentheses) three-day cumulative abnormal returns in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. CARs refer to the three-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Small acquirers are those whose total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry-year asset distribution in a given fiscal year, whereas large acquirers are those whose total assets were at or above the 60th percentile. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	
Three-Day CARs - All Acquirers	1.9%	2.7%	1.0%	9.2	***
	0.9%	1.7%	0.6%	8.4	***
Number of Observations	6,933	3,422	3,511		
Three-Day CARs - Small Acquirers	3.8%	4.9%	2.8%	3.0	***
	1.7%	2.8%	1.4%	2.0	**
Number of Observations	981	462	519		
Three-Day CARs - Large Acquirers	1.3%	1.9%	0.8%	5.5	***
	0.7%	1.3%	0.5%	5.3	***
Number of Observations	4,742	2,325	2,417		

Table 12

Abnormal Return Reversals and Idiosyncratic Volatility

This table reports the average and median (in parentheses) cumulative abnormal returns for twenty-two trading days starting on the second trading day that follow the acquisition announcement. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. Idiosyncratic volatility is measured as the standard deviation of daily abnormal returns over those predicted by the Fama-French 3 factor model in the 200 trading day period ending six trading days before the acquisition announcement. Parameters are estimated from annual Fama-McBeth regressions with standard errors clustered at the firm level. High idiosyncratic volatility acquirers are those whose standard deviation of daily abnormal returns was greater than the group median of 2.28% for the overall sample, 3.24% for small acquirers, or 2.07% for large acquirers. Low idiosyncratic volatility acquirers are those whose idiosyncratic volatility was at or below the median.

	All	High IV	Low IV	t and z stats	
Twenty Two-Day CAR Reversals - All	-1.8%	-2.8%	-0.9%	-5.6	***
	-1.1%	-2.4%	-0.5%	-5.5	***
Number of Observations	6,787	3,359	3,428		
Twenty Two-Day CAR Reversals - Small	-2.7%	-5.0%	-0.8%	-4.1	***
	-1.9%	-4.6%	-1.0%	-4.0	***
Number of Observations	971	457	514		
Twenty Two-Day CAR reversals - Large	-1.5%	-2.2%	-0.9%	-3.5	***
	-0.9%	-1.7%	-0.5%	-3.2	***
Number of Observations	4,636	2,272	2,364		

Table 13

Announcement Abnormal Trading Turnover and Idiosyncratic Volatility

This table reports the average and median (in parentheses) three-day cumulative abnormal trading turnover in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. Trading turnover is calculated as the ratio of daily shares volume (divided by half) to the total number of shares outstanding. Three-day abnormal trading turnover is measured following Bamber (1987) as the cumulative residuals from the predicted trading turnover winsorized at the 1st and 99th percentiles. Predicted trading turnover is calculated on the basis of monthly regressions of the daily turnover on the market turnover in the 12 months preceding the month of the announcement. Market turnover is measured by the equally weighted average turnover of all CRSP stocks on a given day. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	
Abnormal Trading Turnover - All	30%	39%	21%	8.0	***
	16%	25%	10%	7.5	***
Number of Observations	6,803	3,352	3,451		
Abnormal Trading Turnover - Small	57%	81%	37%	6.2	***
	40%	77%	22%	6.3	***
Number of observations	952	448	504		
Abnormal Trading Turnover - Large	22%	28%	16%	5.5	***
	12%	16%	8%	4.7	***
Number of Observations	4,661	2,283	2,378		

Table 14

Short Interest and Idiosyncratic Volatility

This table reports the average and median (in parentheses) short interest in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. Short interest is measured as the ratio of short positions to the total number of shares outstanding in the month of the acquisition announcement calculated from Compustat. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	
Short Interest - All Acquirers	20.3%	16.6%	23.8%	-20.5	***
	13.3%	8.3%	28.4%	-19.1	***
Number of Observations	6,933	3,422	3,511		
Short Interest - Small Acquirers	21.6%	17.6%	25.2%	-8.0	***
	17.8%	8.6%	29.7%	-7.7	***
Number of Observations	981	462	519		
Short Interest - Large Acquirers	19.8%	15.6%	23.8%	-19.6	***
	12.9%	7.3%	29.0%	-18.0	***
Number of Observations	4,742	2,325	2,417		

Table 15

The Effect of Idiosyncratic Risk on Shareholder Gains

with 48 Fama-French Industries

The table shows how acquirer size and idiosyncratic volatility affect shareholder gains in acquisitions of private and subsidiary targets. The dependent variable is three-day cumulative abnormal returns over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1) and (2) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry-year asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60th percentile. Columns (3) and (4) include all observations and measure acquirer size by the log of the firm's total assets. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Private and Subsidiary Targets							
	(1)		(2)		(3)		(4)	
Intercept	1.70		0.82		3.83	***	1.72	
	(0.15)		(0.51)		(0.00)		(0.23)	
Idiosyncratic Risk			44.75	***			48.41	***
			(0.01)				(0.00)	
Small Acquirer Indicator	0.89	***	0.36					
	(0.01)		(0.36)					
Total Assets (Log)					-0.26	***	-0.10	
					(0.00)		(0.16)	
Relative Deal Size	3.17	***	2.87	***	3.26	***	3.04	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Year FE	Yes		Yes		Yes		Yes	
Acquirer Industry FE	Yes		Yes		Yes		Yes	
Number of Observations	5,723		5,723		6,933		6,933	
Adjusted R-squared	0.05		0.06		0.06		0.07	

Table 16

The Effect of Idiosyncratic Risk on Shareholder Gains

with 50 Hoberg-Phillips Product Market Industries

This table reports the analysis in Table 15 using 50 product market industry categories as in Hoberg and Phillips (2010) where information is available on the product market industry applicable to the acquiring firm.

	Private and Subsidiary Targets							
	(1)		(2)		(3)		(4)	
Intercept	3.01		2.13		5.02	*	3.37	
	(0.35)		(0.46)		(0.06)		(0.21)	
Idiosyncratic Risk			37.94	***			35.57	***
			(0.01)				(0.01)	
Small Acquirer Indicator	0.87	*	0.31					
	(0.01)		(0.52)					
Log of Total Assets					-0.24	***	-0.12	
					(0.00)		(0.11)	
Relative Deal Size	2.79	***	2.51	***	3.01	***	2.85	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Year FE	Yes		Yes		Yes		Yes	
Acquirer industry FE	Yes		Yes		Yes		Yes	
Number of observations	4,725		5,723		5,750		5,750	
Adjusted R-squared	0.04		0.05		0.06		0.06	

Table 17

Announcement Abnormal Returns, Acquirer Size, and Short Interest

This table repeats the analysis in Table 15 using the average volume of short interest outstanding in the month of the announcement from Compustat rather than the proxy for short-selling constraints.

	Private and Subsidiary Targets							
	(1)		(2)		(3)		(4)	
Intercept	1.69		1.82		3.83	***	4.01	***
	(0.14)		(0.12)		(0.00)		(0.00)	
Short Interest Outstanding			-0.03				-0.04	
			(0.29)				(0.11)	
Small Acquirer Indicator	0.89	***	0.89	***				
	(0.01)		(0.01)					
Total Assets (Log)					-0.26	***	-0.26	***
					(0.00)		(0.00)	
Relative Deal Size	3.17	***	3.17	***	3.26	***	3.26	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Year FE	Yes		Yes		Yes		Yes	
Acquirer industry FE	Yes		Yes		Yes		Yes	
Number of observations	5,723		5,723		6,933		6,933	
Adjusted R-squared	0.05		0.05		0.06		0.06	

Table 18

Cross-sectional Analysis of Announcement Abnormal Returns

with 48 Fama-French Industries

The table shows the impact of acquirer size and idiosyncratic volatility on shareholder gains in acquisitions of private and subsidiary targets in regressions employing the full set of control variables shown to matter in event studies on corporate acquisitions. The dependent variable is three-day cumulative abnormal returns over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1) and (2) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry-year asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60^{th} percentile. Columns (3) and (4) include all observations and measure acquirer size by the log of the firm's total assets. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 18 continued

	Private and Subsidiary Targets							
	(1)		(2)		(3)		(4)	
Intercept	0.74		1.02		0.99		1.93	
	(0.59)		(0.43)		(0.52)		(0.18)	
Idiosyncratic Risk	64.85	***	42.70	***	75.47	***	49.14	***
	(0.00)		(0.01)		(0.00)		(0.00)	
Small Firm Indicator	0.02		0.37					
	(0.90)		(0.38)					
Total Assets (Log)					-0.03		-0.10	
					(0.78)		(0.14)	
Market to Book	-0.08	**	-0.04		-0.05		-0.03	
	(0.04)		(0.15)		(0.15)		(0.34)	
Acquirer Leverage	-0.07		0.43		-0.12		0.15	
	(0.95)		(0.56)		(0.89)		(0.81)	
Acquirer Excess Cash	-0.62		-0.32		-1.27		-0.88	
	(0.63)		(0.73)		(0.25)		(0.28)	
Illiquidity	0.10		0.06		0.08		0.05	
	(0.59)		(0.68)		(0.64)		(0.71)	
Relative Deal Size	2.50	***	2.65	***	2.85	***	2.83	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Target Premium	-0.06				-0.06			
	(0.14)				(0.14)			
Change in operating ROA	1.60		-0.53		0.58		-0.22	
	(0.53)		(0.78)		(0.80)		(0.90)	
Change in Sales Growth	0.36		0.31		0.61		0.42	
	(0.57)		(0.37)		(0.23)		(0.41)	
Cash Payment	0.08		-0.09		0.15		-0.02	
	(0.76)		(0.64)		(0.54)		(0.91)	
Diversifying	-0.14		0.00		-0.20		-0.09	
	(0.67)		(0.99)		(0.48)		(0.69)	
Year FE	Yes		Yes		Yes		Yes	
Acquirer Industry FE	Yes		Yes		Yes		Yes	
Number of observations	3,480		5,723		4,301		6,933	
Adjusted R-squared	0.06		0.06		0.08		0.07	

Table 19

Cross-Sectional Analysis of Announcement Abnormal Returns

with 50 Hoberg-Phillips Product-Market Industries

This table repeats the analysis in Table 18 using 50 product market industry categories as in Hoberg and Phillips (2010) where information is available on the product market industry applicable to the acquiring firm.

	Private and Subsidiary Targets			
	(1)	(2)	(3)	(4)
Intercept	1.38	2.44	2.53	3.67
	(0.70)	(0.36)	(0.44)	(0.15)
Idiosyncratic Risk	73.4 ***	46.14 ***	73.02 ***	46.06 ***
	(0.00)	(0.01)	(0.00)	(0.00)
Small Firm Indicator	0.26	0.54		
	(0.61)	(0.19)		
Total Assets (Log)			-0.08	-0.11
			(0.43)	(0.11)
Market to Book	-0.39	-0.01	-0.01	-0.02
	(0.76)	(0.83)	(0.93)	(0.83)
Acquirer Leverage	-0.35	0.59	-0.13	0.35
	(0.74)	(0.42)	(0.88)	(0.58)
Acquirer Excess Cash	0.31	0.42	-0.81	-0.33
	(0.82)	(0.64)	(0.48)	(0.68)
Illiquidity	-0.14	-0.16 *	-0.14	-0.17
	(0.28)	(0.10)	(0.25)	(0.07)
Relative Deal Size	2.40 ***	2.60 ***	2.82 ***	2.95 ***
	(0.00)	(0.00)	(0.00)	(0.00)
Target Premium	-0.06		-0.06	
	(0.11)		(0.13)	
Change in operating ROA	0.29	0.27	1.67	0.06
	(0.32)	(0.89)	(0.51)	(0.97)
Change in Sales Growth	0.53	0.24	0.73	0.34
	(0.49)	(0.35)	(0.23)	(0.25)
Cash Payment	0.10	0.09	0.09	-0.10
	(0.75)	(0.66)	(0.74)	(0.62)

Table 19 continued

	Private and Subsidiary Targets			
	(1)	(2)	(3)	(4)
Diversifying	-0.17	-0.15	-0.16	-0.19
	(0.62)	(0.52)	(0.59)	(0.37)
Year FE	Yes	Yes	Yes	Yes
Acquirer industry FE	Yes	Yes	Yes	Yes
Number of observations	2,773	4,725	3,455	5,750
Adjusted R-squared	0.04	0.05	0.06	0.06

Table 20

Short Interest and Shareholder Gains

This table repeats the analysis in Table 15 using the average volume of short interest outstanding in the month of the announcement from Compustat rather than the proxy for short selling constraints.

	Private and Subsidiary Targets							
	(1)		(2)		(3)		(4)	
Intercept	1.91		1.90		3.98	***	4.09	***
	(0.16)		(0.11)		(0.01)		(0.00)	
Short Interest Outstanding	-0.02		-0.02		-0.03		-0.03	
	(0.50)		(0.31)		(0.37)		(0.11)	
Small Firm Indicator	0.69		0.78	**				
	(0.15)		(0.05)					
Total Assets (Log)					-0.24	***	-0.25	***
					(0.01)		(0.00)	
Market to Book	-0.04		-0.04		-0.02		-0.03	
	(0.73)		(0.56)		(0.86)		(0.62)	
Acquirer Leverage	0.10		0.47		-0.09		0.19	
	(0.92)		(0.53)		(0.91)		(0.76)	
Acquirer Excess Cash	0.22		0.34		-0.62		0.36	
	(0.87)		(0.72)		(0.59)		(0.66)	
Illiquidity	0.17		0.10		-0.16		0.10	
	(0.35)		(0.48)		(0.33)		(0.45)	
Relative Deal Size	2.81	***	2.87	***	3.09	***	2.98	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Target Premium	-0.08	**			-0.07	*		
	(0.03)				(0.06)			

Table 20 continued

	Private and Subsidiary Targets			
	(1)	(2)	(3)	(4)
Change in Operating ROA	2.13	-0.12	1.42	0.28
	(0.41)	(0.98)	(0.53)	(0.87)
Change in Sales Growth	0.20	0.25	0.40	0.33
	(0.75)	(0.46)	(0.41)	(0.25)
Cash Payment	-0.05	-0.16	0.01	-0.10
	(0.95)	(0.40)	(0.95)	(0.56)
Diversifying	-0.15	-0.01	-0.18	-0.08
	(0.65)	(0.98)	(0.52)	(0.71)
Year FE	Yes	Yes	Yes	Yes
Acquirer industry FE	Yes	Yes	Yes	Yes
Number of observations	3,480	5,723	4,301	6,933
Adjusted R-squared	0.06	0.05	0.07	0.06

CHAPTER 5

CONCLUSION

My dissertation documents that the negative relationship between acquirer size and shareholder gains in corporate acquisition events is caused by limits to arbitrage rather than differential growth opportunities among small and large firms.

The Coasian theory of the firm posits the existence of an optimal firm size at the level where the marginal cost of internal coordination is the same as the marginal cost of obtaining the input from the external market. Coase's theory suggests that acquisition announcements made by firms below the optimal size (likely small firms) generate more size adjusted shareholder wealth than acquisitions by firms above the optimal size (likely large firms) because the former have greater potential for enhancing productivity by growing via acquisitions.

Alternatively, the relationship between acquirer size and abnormal announcement returns can reflect persistent market frictions arising from limits to arbitrage. Since the shares of small firms face greater short-selling constraints, the buying pressure in response to the acquisition news will bid up the price to a higher level.

My evidence supports the latter explanation: differential announcement effects of small versus large acquirers arise in acquisitions of private and subsidiary targets perceived by the market as positive news.

Greater short-term shareholder gains in the case of small acquirers are accompanied by greater abnormal turnover and followed by larger reversals, suggesting that differential gains reflect greater temporary buying pressure. In event study regressions, the effect of short-selling constraints proxied by the idiosyncratic volatility of the acquirer's shares subsumes the effect of acquirer size signifying that the size effect is driven by differential limits to arbitrage.

The dissertation clarifies that the impact of acquirer size on shareholder gains is independent from the impact of overpayment for the target and postmerger efficiency gains. Although small acquirers pay lower target premiums and realize greater improvements in postacquisition efficiency, controlling for these variables in multivariate regressions does not impact the magnitude and significance of the control variable on acquirer size.

The evidence is consistent with the explanation that short-selling constraints lead to greater market overreaction to corporate acquisitions events perceived by the market as good news. Limits to arbitrage distort the formation of the efficient price by excluding pessimistic investors to trade on their beliefs.

APPENDIX

VARIABLE DEFINITIONS

Variable	Definition
Announcement Abnormal Returns	Cumulative abnormal returns (CARs) over the returns predicted by the Fama-French (1993) 3-factor model summed in three event days starting one day before the announcement. The 3-factor model parameters are estimated over the 200-day period starting 206 days before the announcement of the acquisition.
Announcement Abnormal Trading Turnover	Cumulative abnormal trading turnover summed in three event days starting one day before the announcement over the predicted turnover. Prediction parameters are generated in the 12-month period preceding the month of the acquisition announcement, following Bamber (1987). Trading turnover is calculated as the ratio of daily shares volume (divided by half) to the total number of shares outstanding. Predicted turnover is calculated in monthly regressions of daily turnover on the basis of the following model: $\ln(TO_{it}) = \alpha_i + \beta_i(\ln(TO_{mkt,t}))$ where market turnover refers to the equally weighted average turnover of all CRSP stocks on a given day. Cumulative abnormal trading turnover is winsorized at the 1st and 99th percentiles.
Change in Operating Return on Assets	The difference between the average operating return on assets in the two years that follow the effective fiscal year of the acquisition and the average operating return on assets in the two preceding years. Operating return on assets is calculated from Compustat as {ebitda/at} and winsorized at the 1st and 99th percentiles.

Variable	Definition
Change in Sales Growth	The difference between the average sales growth in the two years that follow the effective fiscal year of the acquisition and that in the two preceding years. Sales growth is calculated from Compustat as { $sale_{(t)}/sale_{(t-1)}$-1} and winsorized at the 1st and 99th percentiles.
Diversifying Merger Indicator	=1 if the acquirer's primary Fama-French 48 industry group is different from the target's primary Fama-French 48 industry group.
Excess Cash	The difference between the firm's cash holdings scaled by total assets and the predicted median for the Fama-French 48 industry in the fiscal year following Harford (1999) and winsorized at the 1st and 99th percentiles.
Idiosyncratic Risk	Standard deviation of the residuals in regressions of daily stock returns on the three Fama and French (1993) factors following Ang, Hodrick, Xing, and Zhang (2006) in the 200-day period ending 6 days before the acquisition announcement, winsorized at the 1st and 99th percentiles. Parameter estimates for the predicted returns are obtained by annual Fama-McBeth regressions.
Illiquidity	Average daily ratio of absolute stock return to dollar trading volume, following Amihud (2002). Calculated from CRSP data as 1,000,000 * abs(ret) / abs(prc)*volume. Winsorized at the 1st and 99th percentiles.
Industry	The industry grouping of the firm based on the 48 Fama-French (1992) industry categories assigned by the firm's Compustat SIC code in the fiscal year.
Log(Assets)	Logarithm of the total book assets, constructed for each firm-year at the beginning of the fiscal year. Winsorized at the 1st and 99th percentiles
Leverage	Long-term debt over market capitalization in the beginning of the fiscal year, constructed for each firm-year. Calculated from Compustat as dltt / (cshpri * prcc_f) and winsorized at the 1st and 99th percentiles.
Market to book	Market capitalization over the book value of total equity in the beginning of the fiscal year. Calculated from Compustat as (cshpri * prcc_f) / ceq and winsorized at the 1st and 99th percentiles.
Private Target Indicator	=1 if the target is a private firm in SDC, otherwise 0.
Public Target Indicator	=1 if the target is a publicly listed firm in SDC, otherwise 0.

Variable	Definition
Pure Cash Deal	=1 if the transaction was financed entirely by cash according to SDC, otherwise 0.
Relative Deal Size	Total transaction value in SDC divided by the acquirer's market capitalization at the beginning of the fiscal year from Compustat. Winsorized at the 1st and 99th percentiles.
Short Interest Ratio	Short interest (Compustat Supplemental Short Interest file, item: adjusted short interest) relative to the total number of acquirer shares outstanding. Winsorized at the 1st and 99th percentiles.
Small Firm Indicator	=1 if the book value of total assets (Compustat item at) falls within the 40th percentiles of the distribution in the firm's industry; =0 if the book value of total assets falls between the 60th and 100th percentiles of the distribution in the firm's industry. Industry specifications follow the 48 industry categories in Fama and French (1997).
Subsidiary Target Indicator	=1 if the target is listed firm in SDC as a subsidiary of another firm, otherwise 0.
Target Premium	Change in goodwill net of goodwill amortization and pre-tax goodwill impairment (Compustat items gdwl, gdwlam, and gdwlip) divided by the total deal value from SDC. Calculated for acquisitions of private and subsidiary targets where the acquirer made a single announcement within a fiscal year. Winsorized at the 1st and 99th percentiles.
Tobin's Q	Tobin's Q measured as the market to book assets ratio following Adam and Goyal (2008) as the sum of (equity market capitalization + preferred stock + debt in current liabilities + long term debt) over the book value of total assets. Calculated from Compustat as ((prcc_f * cshpri) + pstk + lct+ dltt – txditc) /at.

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